



# PATENT SPECIFICATION

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288,196

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## COMPLETE SPECIFICATION.

### A Process and Apparatus for Grinding, Smoothing, and Polishing Plates of Glass, Marble or other similar Materials.

I, EUGENE ROWART, of Auvelais, Belgium, a Belgian subject, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to a process and apparatus for grinding, smoothing and polishing plates of glass, marble or other similar materials by means of burnishers or polishers, of the kind in which the burnishers or polishers are displaced above the plates which are secured on tables or other similar supporting means.

Apparatus of this kind are known in which rotative rubbing members move above tables in a direction at right angles to the direction of movement of the latter. It results from this rotative motion of the rubbing members that polishing or rubbing material is projected to the periphery of the rubbing members and tables so that the surfaces of the plates are not given the required uniform and regular smoothness.

Devices are known also comprising two vertical and parallel frames each provided with abrading or buffing heads and acting on an interposed plate of glass adapted to be reciprocated in a plane perpendicular to the plane in which the frames are moved.

The process forming the subject of the invention, has for its object to obviate these inconveniences, to accelerate the operations, and to obtain glass plates having an equal smoothness over their whole surface. With this object in view, the process is essentially characterized by non-rotative rubbing members which form for each stage of the work an endless chain running at a high speed on a guide or monorail in the form of an elongated ring, the straight line movements of the rubbing members being at right angles to the direction of the movement of the tables.

The invention further consists in apparatus for carrying out the process stated above, and also comprises details of construction hereinafter described and set out in the appended claims.

[Price 1/-]

In order that the invention may be fully understood I will describe it with reference to the accompanying drawings:—

Figure 1 is a side elevation of a machine constructed in accordance with the invention, showing several grinding or smoothing elements and also a table carrying the sheets or plates or material to be treated.

Figure 2 is a plan view, the left half of which illustrates the apparatus on the level of the lateral rails whilst the right half is taken from the higher level of the carrier rail, the grinding or smoothing elements being removed.

Figure 3 is a transverse elevation illustrating a structure with the rods and rails in section and two grinding or polishing elements.

Figure 4 is a view of three elements drawn to a larger scale, one of the elements being shown together with its motor.

Figure 4<sup>a</sup> shows separately one of the burnishing irons as used for the first operation namely that of grinding.

Figure 5 is a diagram showing the position of the polishers or other working elements during their travel along the curved part of the monorail.

Figure 6 is a cross-section of the table on which the glass plates or the like are bedded.

Figures 7 and 8 are side views in section showing details of the table assemblage, the resilient fixing of the tables to the carrying frames, and means for fixing the glass plates to the joints of the tables and adjustable mechanism permitting the movement of the tables by a sprocket chain.

Figure 9 is a section similar to Figure 6, illustrating a part of the apparatus which allows of the displacement of the table by a reciprocating movement and which is specially applied to the work of polishing.

1 designates the frame of the apparatus which consists of a fixed part 2 and a movable part 3; the latter carries a nut 4 for regulating its height and a ring 5 to which a cable 7 is attached, which cable

supports at the other end a system of counter-weights 6.

8 is a framework which is jointed to the movable part 3 through the bearings

9. 10 (Figures 1 and 2) denotes supports or crossbars which connect a monorail 11 to the framework 8.

12 (Figures 1 and 2) denotes rails which are designed to guide the grinding, smoothing and polishing elements near the base of the latter.

13 designates the polishers which are attached to the plates 15. For the first grinding operation, however, burnishing irons 13<sup>a</sup> (Figure 4<sup>a</sup>) are substituted for the said polishers.

14 (Figures 1 and 3) denotes the smoothing and polishing elements which consist of the plates 15 each of which carry a male part 16 and a female part 17 by means of which the plates are assembled together in a series, in the form of an endless chain rigid horizontally and jointed laterally. The female parts carry a bolt-hole 18 and the male parts carry a bolt-hole 19. These elements are adjusted and are assembled with the male part within the female part. A pivot pin 20 (Figure 4) which passes through the bolt-holes in the male and female parts rests by a shoulder on the upper part of the female part and is secured beneath the lower end of this part by a collar with a locking pin. Above the shoulder of this pivot, which serves as an axis, are arranged horizontally rollers 21, the object of which is to maintain the polishers in alignment with the guide-rails 12 when the bolted members slide slightly.

22 (Figures 1 and 3) designates connecting bars, which are designed to transmit movement to the plates 15 on which they are secured vertically; 23 designates the upper part of certain of these bars 22, which upper part is shaped in the form of a hook and carries an electric motor 27 which receives its current from the power line 27<sup>a</sup> (Figure 3).

24 denotes wheels carried by the bars 22 and by means of which the apparatus moves on the monorail 11. The upper wheel 24 rests on the monorail 11 and the lower wheel is pressed against the said monorail immediately beneath the said upper wheel. On the axle of the said lower wheel are mounted a toothed wheel 25 and a pulley wheel 26. The pulley wheel 26 receives its movement from the electric motor 27 fixed to the upper part of the bars 22 and toothed wheel 25 transmits its movement to a toothed wheel 28 which drives the upper wheel 24.

29 (Figure 1) denotes tables on which

the plates of glass or other material are fixed; these tables consist of a frame 30 on which is fixed the platform or upper part 31; the parts in contact between the frame 30 and the platform 31 are perfectly finished as well as the surface on which the glass plates or other plates are fixed.

The platform 31 is secured to the frame 30 by bolts 32 (Figures 6 and 7) carrying springs 33 (Figure 7) which are pressed by nuts against the frame 30, and which form resilient supports for the plate 31, thereby enabling it to move slightly in the vertical direction with a certain amount of elasticity.

The frame 30 is mounted on the train of wheels 34 which roll on rails 35 and the platform 31 carries rollers 36 on vertical axes (Figure 9). Along the path of rolling formed by the rails 35 are fixed at the height of the rollers 36 two lines of guides 37 perfectly adjusted parallel to one another, between which the tables 29 move, the said tables being guided by the rollers 36 which roll in contact with the guides 37 (Figure 6).

38 (Figure 7) indicates the device for connecting the tables together. The said device is integral with the platform 31 and is suitably placed, so that the holes 39 of one table exactly face corresponding holes in the following or preceding table and receive pins 40 which join the tables together in blocks.

41 (Figure 8) indicates a horizontal pin arranged in projections at the ends of the platform 31 and fitting in a corresponding hole 42<sup>a</sup> in the transverse part formed at the end of the platform 31 of the following table.

42 indicates a device arranged on the frame 30 which is designed to establish the connection between an endless chain 43 and the tables for moving the latter; this device carries a fork 44 which can be displaced in a vertical plane when the wheel 44<sup>a</sup> is actuated in order to establish the connection with the chain or to cancel this connection at will. The connection of the chain 43 with the tables is effected when the fork 44 is lowered into the line of the pins 45 of the links of the chain by the operation of the hand-wheel 44<sup>a</sup>. The horizontal movement of the fork 44 for making contact with the pins 45 is effected by operating a hand-wheel 46 which causes the arrangement to be displaced between the guide supports 47.

48 (Figure 8) designates a slightly cut-away portion of the two adjacent transverse edges of the platform 31. Under this cut-away part, and at one of its edges, is formed a groove 48<sup>a</sup>, in which is fitted a member 49 which can be moved

forwards or backwards by suitable means, for instance, under the action of a spring arranged in the groove 48<sup>1</sup>. This member is designed to press and fix against the edge of the preceding table the lower part of a belt of doubled fabric 50, the upper edges of which are coated on a thickness a little greater than the open joint between the glass plates at the end of the two tables, with a material which is adhesive and plastic at a predetermined temperature, so that, when two tables are attached to one another, there exists between the glass plates at the ends of the two tables, a perfect joint which fixes the glass plates to the table and prevents all vertical movement of the plates and the introduction of foreign matter beneath the said plates.

51 (Figure 9) indicates a crank and a connecting rod for producing a reciprocating motion which drives a carrier or conveyor 52 by a support 53 which is secured thereto.

54 indicates an endless chain which passes around two chain wheels on the carrier 52, which chain receives its movement from an electric motor 55 which is designed to drive, with a continuous rectilinear movement, the tables used for the work of polishing to remove them after the said polishing operation.

56 (Figure 1) indicates a platform surrounding the frames and on which the rubbing elements bear, when they leave the table.

In the drawings, the pipes and arrangements for feeding the abrasive and other treating materials have been omitted in order to maintain more clearness and to facilitate the understanding.

In practice, the dimensions of the rubbing members, burnishers or polishers and the speed of the said members and of the tables as well as the pressure on the plates to be treated vary, according to the various stages of the work.

The apparatus consists of a track, the rails 35 of which are fixed at a distance determined by the width of the tables in a perfectly horizontal plane.

The tables 29, the dimensions of which vary according to the weight and dimensions of the articles to be treated move on the track, drawn by the endless chain, 43 with a definite speed between two parallel lines of guides 37, which prevent the lateral movements which the said tables might acquire during the operation.

Above the track in the horizontal direction and at right angles to the direction of the rails 35 rubbing elements are arranged parallel to one another and following one another at suitable dis-

tances so that the distributing devices for the abrasive and other material can be placed between each line of elements.

The rubbing members of each apparatus, that is to say, the members moving on the monorail 11 move at a speed suitable for the particular stage of the operation which they perform in two lines in opposite directions produced by the arrangement of the members in the form of an endless chain.

Each of the stages of the operation requires a sufficient number of rubbing devices to accomplish the work whether it concerns the surfacing, smoothing or polishing of the glass.

As shown in Figure 9 under the polishing elements is found the carrier or frame 52 forming a transhipping frame for the tables.

This frame is furnished with rollers 52<sup>a</sup> by means of which it can be moved along rails 52<sup>b</sup>. The frame 52 carries rails 52<sup>c</sup> on which are run the tables carrying the plates to be polished. These tables can be rendered immovable on the frame by means of stops which are fixed on the rails against the wheels and which are not shown on the drawing.

The to and fro movement is obtained in the following manner:—

The frame carries at its lower part a support 53. Also below the frame are provided bearings 57 fixed to the foundation. In these bearings rotates a shaft 58 carrying at one extremity a pulley 59 driven by a belt 60 receiving its movement from a motor, to the other extremity of the shaft 58 is fixed a crank 51 which is engaged with the bracket 53 fixed to the transhipper 52 by means of a connecting rod 61. It is by this connecting rod that the rectilinear to and fro movement is communicated to the transhipper 52.

The operation of the apparatus is effected in the following manner:—The plates of glass, etc., are bedded on the tables 30 by known means so that the sides of the plates correspond with the two edges of the table on the side edges; the glass plates are arranged so as to form a joint between them and a member fixed to the edges of the table in which cement or another fixing material is poured. All the devices carrying the rubbing elements are raised by means of the movable parts 3 and the first table 30 occupies a position under the first apparatus, the function of which is to grind the plates of glass, etc. The monorail, together with the rubbing members are lowered by the movable parts 3 so that the rubbing members make contact with the glass. The rubbing members are then moved by means of the motors 27.

The table moves afterwards underneath a second group of rubbing members similar to those just described and which are also set in motion and lowered until the burnishers 13<sup>1</sup> (Figure 4<sup>a</sup>) operate suitably on the glass. The same operation is then repeated for each group of rubbing devices; a second table is attached to the first and as the tables advance more tables are added until that table which has passed the apparatus for effecting the grinding, and smoothing of the glass, begins to leave the last apparatus. From this moment the tables move at a suitable and continuous speed, and they are removed from the system as they pass the last smoothing apparatus and in the meantime new tables are attached to the series.

The tables carrying the smoothed glass are then caused by an electric motor 34<sup>a</sup> to run on to the carrier 52 and under the polishing apparatus constructed in the same manner as the apparatus hereabove described, where they receive a reciprocating movement of a definite speed and a suitable amplitude so that all the parts of the glass may be worked uniformly. The polishing members are then lowered and the rubbing elements rub on the glass at a high speed and with a definite pressure.

When the polishing operation is finished, the reciprocating movement stops. The tables are freed on the carrier and are removed by the endless chain 54 or by the motor 34<sup>a</sup>. In the meantime new tables carrying glass are attached and follow those on which the operation has finished. These tables are connected together successively beneath the apparatus as the other tables leave it and the grinding operation commences on the new table under the first apparatus so that when the new tables advance under the rubbing members, the second stage of the work is ready to commence.

From this moment, the continuous movement of the tables stops and is replaced by a reciprocating movement after the tables have been secured on the carrier. The rubbing members of the polishing apparatus on leaving the table continue the movement in the curve on the platform (56) hereinbefore referred to, carrying on its surface a plate of polished glass or any other suitable material and the position of which is adjusted at exactly the same level as the level of the glass plates carried by the tables.

The foregoing operations may be summarised as follows:—

1. Tables carrying the glass or the like move continuously in one direction first

beneath the groups of grinding members and thence beneath the groups of smoothing members which move across the glass or the like, the tables carrying the glass etc. which has been smoothed being then removed and fresh tables carrying untreated glass added at the commencing end of the apparatus.

2. The tables carrying the smoothed glass or the like are run on to the carrier 52 and reciprocated beneath the polishing elements also moving across the glass or the like.

3. The tables carrying the polished or finished glass etc. are removed from the carrier 52 to enable the said glass or the like to be taken off the tables.

It is easy to understand that the judicious distribution of the rubbing materials before each of the lines of rubbing element which move at the same time as the tables at suitable speeds, will produce on the glass a result which is much superior to that produced by the known apparatus, which are all based on the circular movement of the rubbing elements.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. A process of grinding, smoothing and polishing plates of glass, marble and other similar hard materials in which the rubbing members arranged in series are displaced in a straight line direction at right angles to the direction of the movement of the tables carrying the plates to be worked, characterized in that the rubbing members which are non-rotative, form for each stage of the work an endless chain and are displaced at high speed along a guide or monorail and make contact with the plates to be worked along straight paths.

2. Apparatus for carrying out the process as claimed in Claim 1, wherein rubbing members form for each stage of the work an endless chain running at high speed on a monorail in the form of an elongated ring arranged at right angles to the direction of the movement of the tables carrying the plates to be treated.

3. Apparatus as claimed in Claim 1, wherein the rubbing members are secured to plates provided with male parts and female parts by means of which the said plates are assembled together, the said plates being supported by bars provided with wheels rolling on the monorail.

4. Apparatus as claimed in Claims 2 and 3, wherein the bars carrying the plates are provided with rollers rolling on guiding rails, the position in height of

the bars, together with that of their plates being adjustable by the adjustment of the height of the monorail which is, for that purpose, supported laterally by  
5 a framework mounted on supports which can be vertically displaced.

5. Apparatus as claimed in Claims 2 to 4, wherein the rubbing members are moved while rubbing on the plates to be  
10 treated which are supported by tables, this movement being produced by means of electric motors mounted on the bars to which are fixed plates carrying the rubbing elements, and the said motors driving  
15 through a suitable transmission, the wheels running on the monorail.

6. Apparatus as claimed in Claims 2 to 5, wherein the movable tables supporting the plates to be treated, comprise a  
20 frame rolling on a track and a platform resiliently fixed on the frame, the platforms of the different tables being assembled together by means of pins and of joining members.

7. A form of embodiment of the apparatus as claimed in Claims 2 to 6, wherein for the stage of polishing, the tables supporting the plates to be treated receive a reciprocating movement by means of a  
30 carrier.

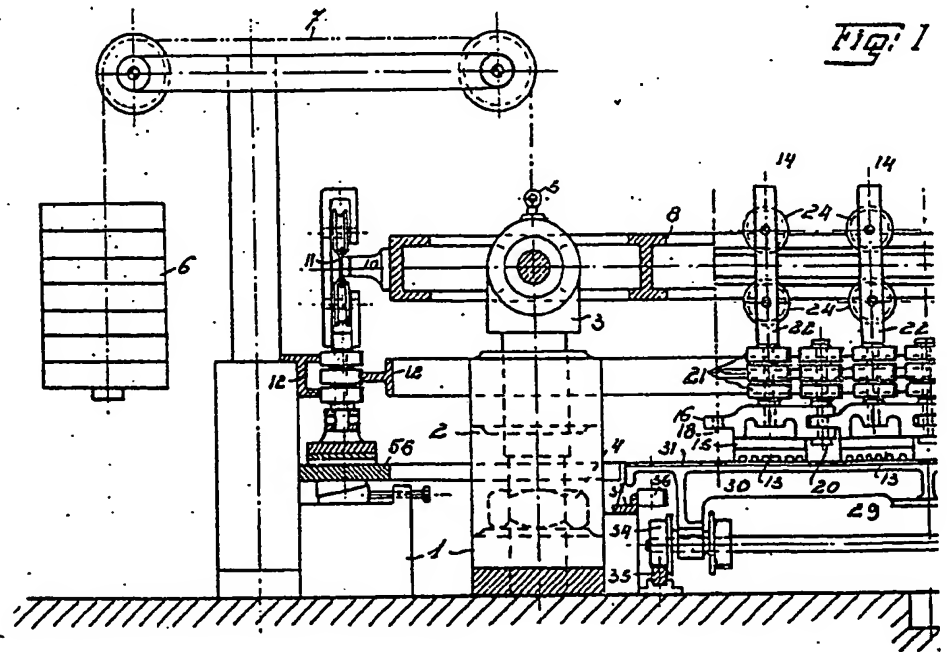
8. Apparatus according to Claims 2 to 7, comprising a series of monorails and rubbing members forming an endless chain, arranged parallel one to each other, the said rubbing members being  
35 adapted to the stage of the work to be performed.

9. The improved process and apparatus for grinding, smoothing and polishing  
40 glass, marble and other similar materials substantially as described and illustrated in the accompanying drawings.

Dated the 7th day of November, 1927.

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15, South Street, Finsbury, E.C. 2,  
Agents for the Applicant.

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**Fig. 2.**

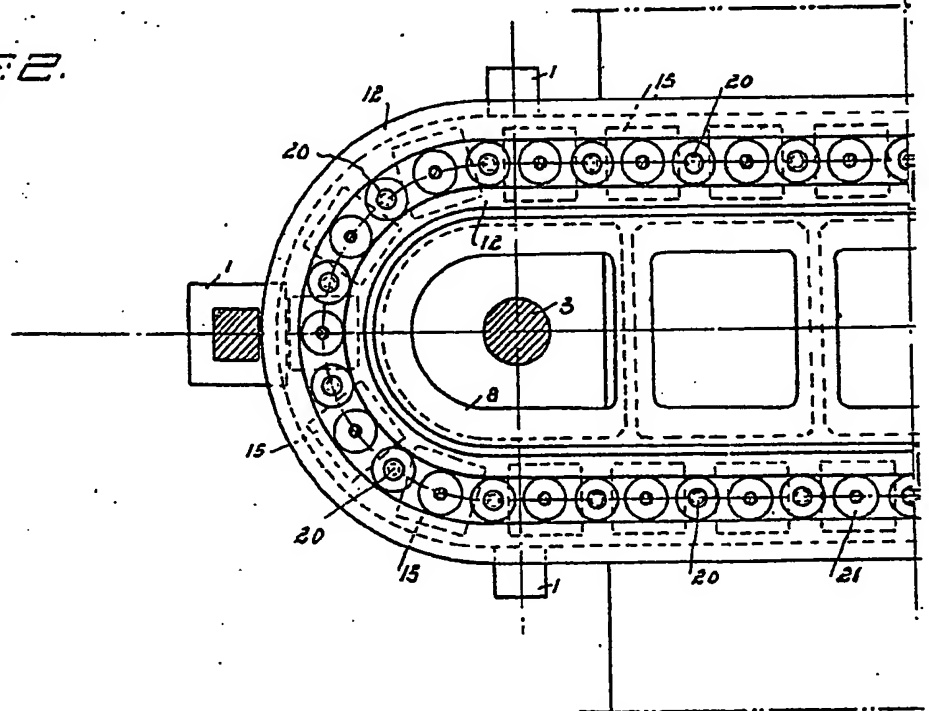
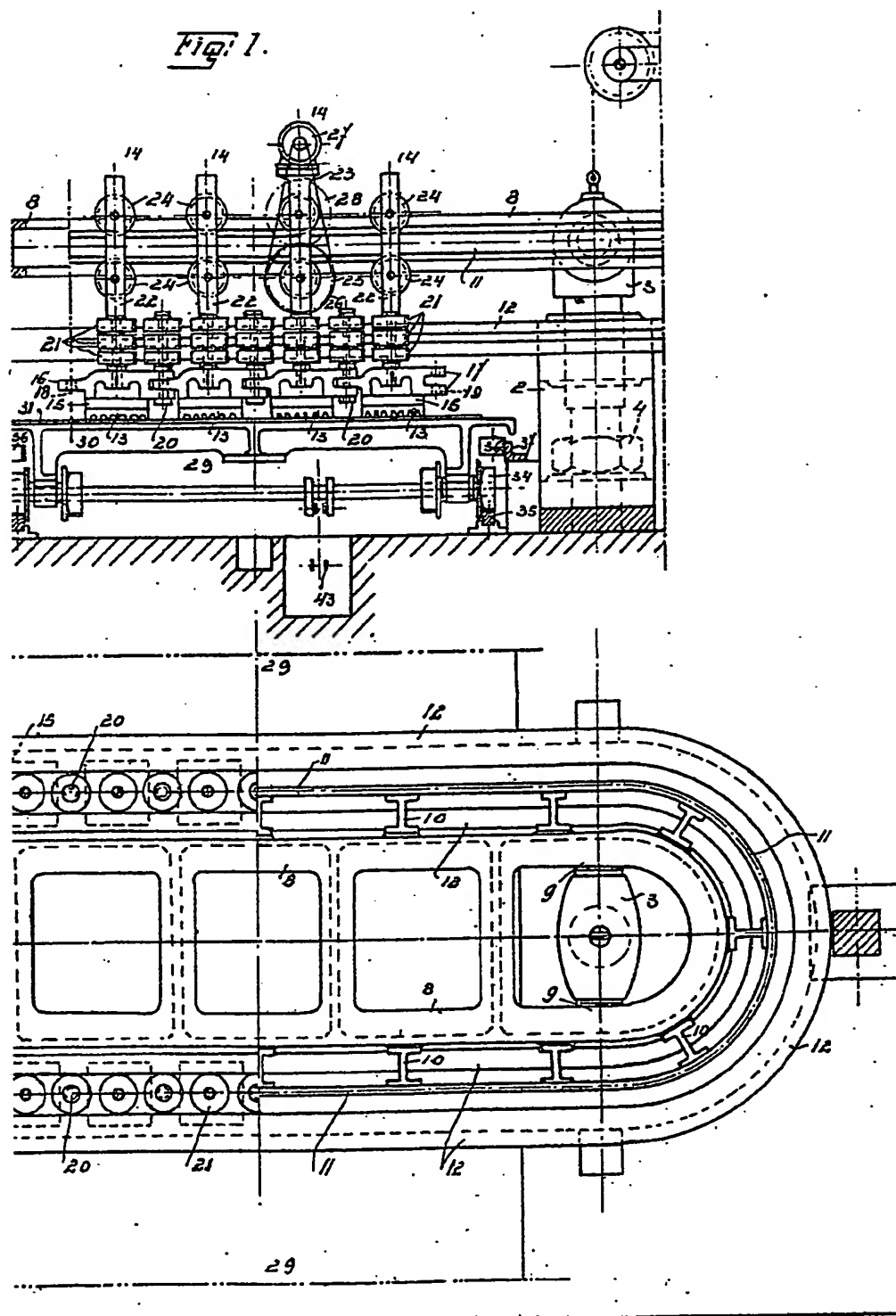


Fig. 1.



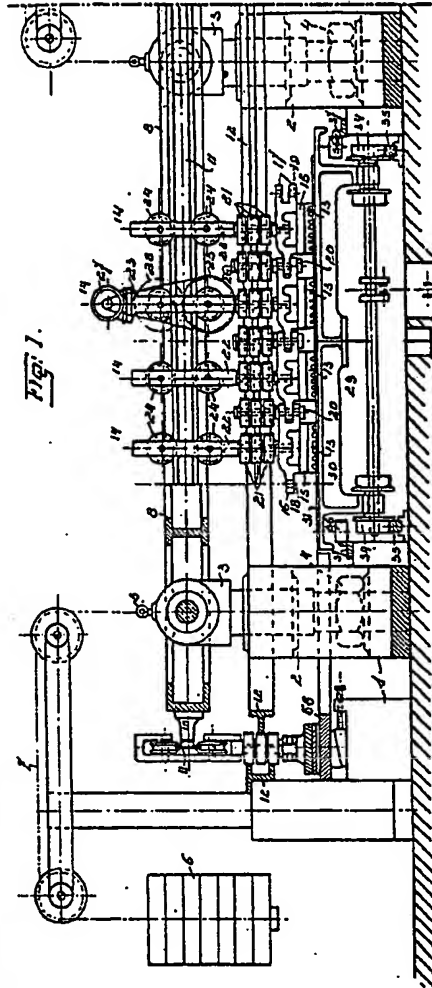


Fig. 1.

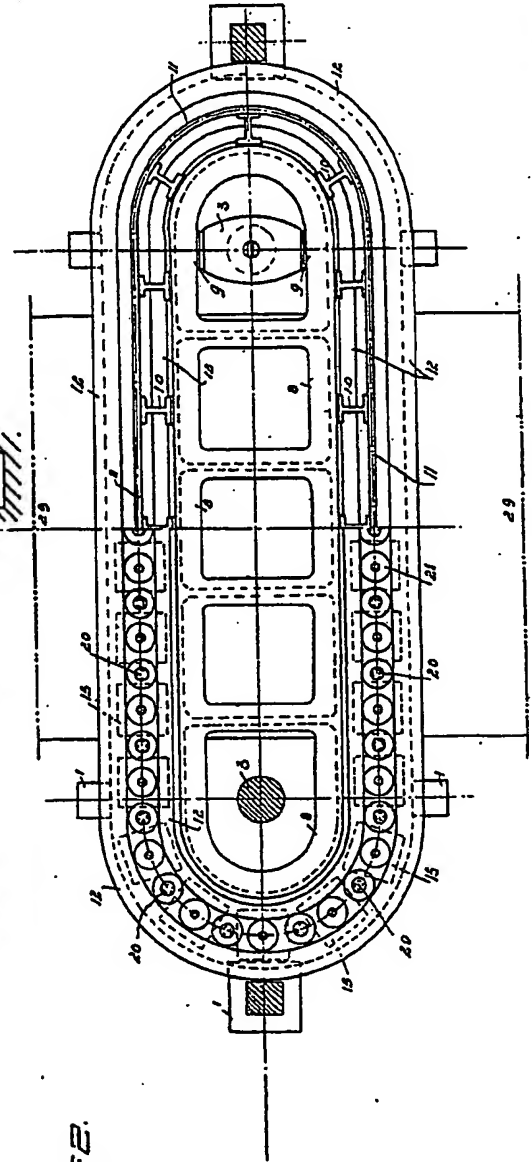


Fig. 2.

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Fig. 3.

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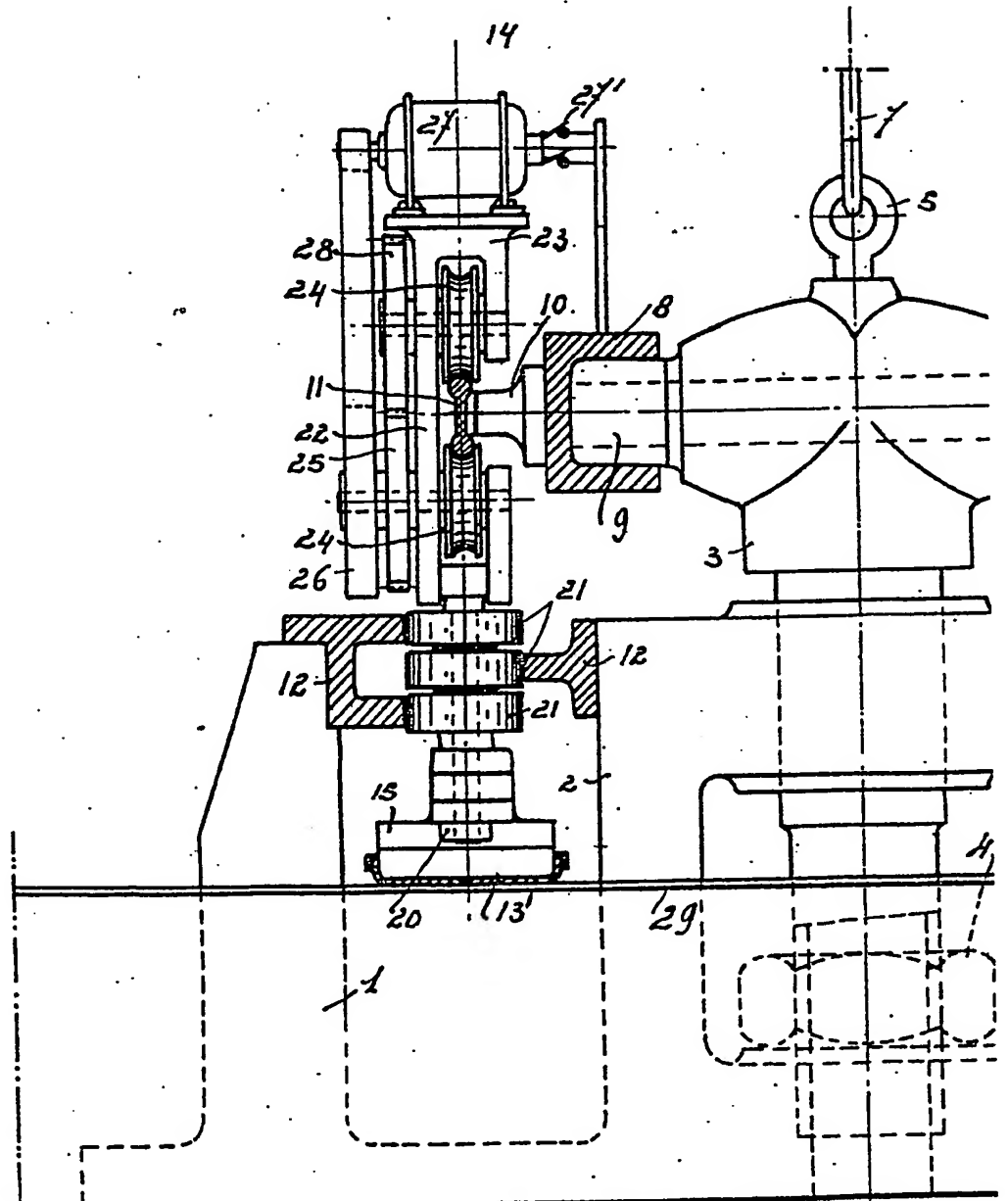


Fig. 3.

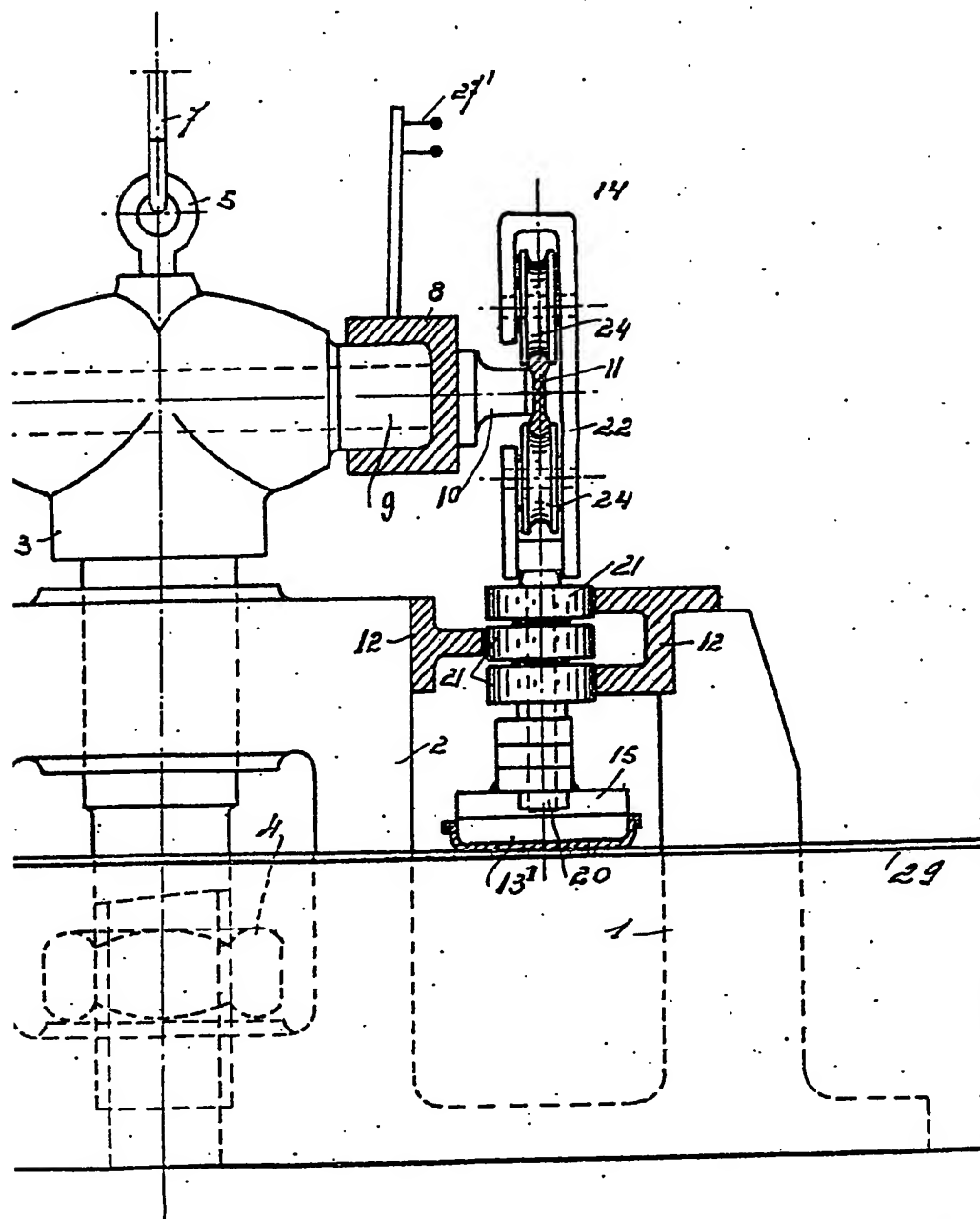
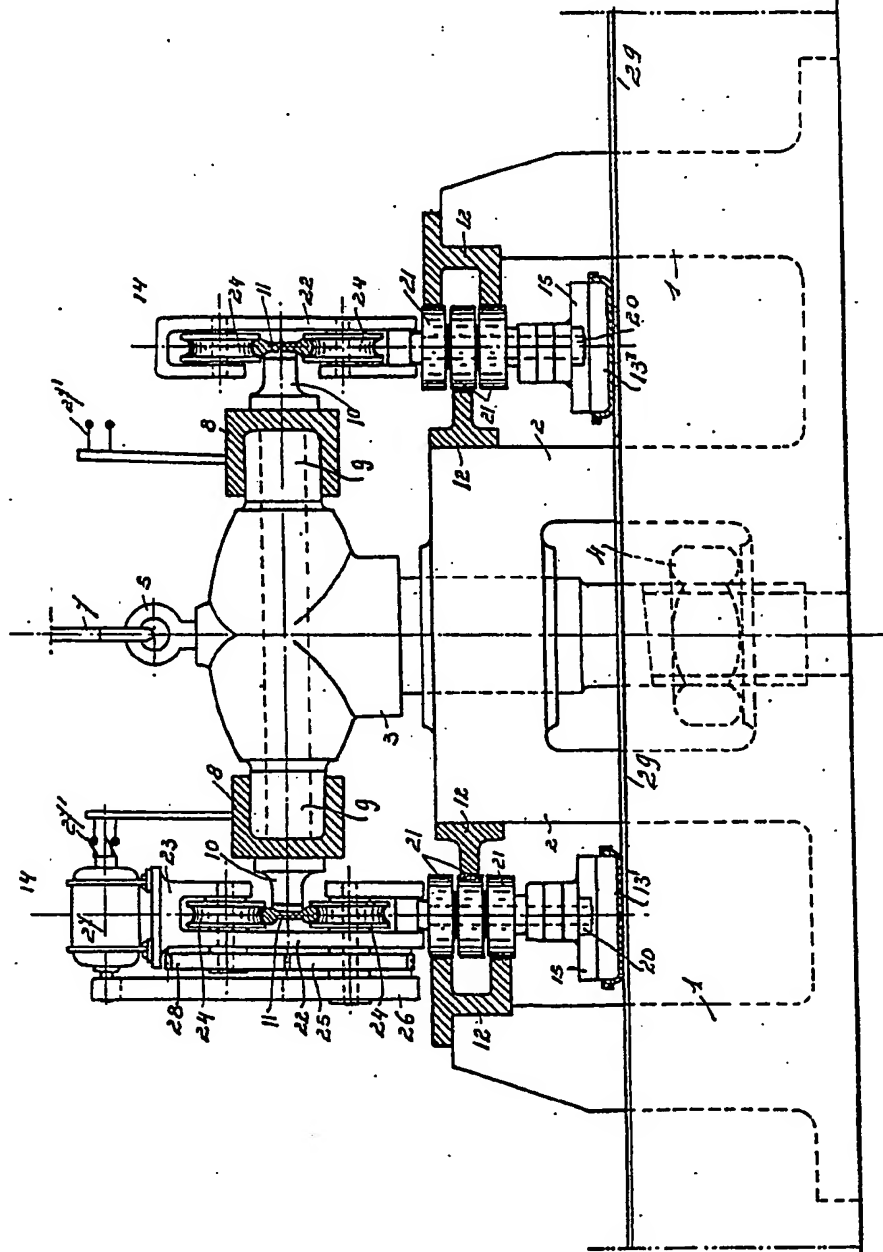


Fig. 3.



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Fig. 4.

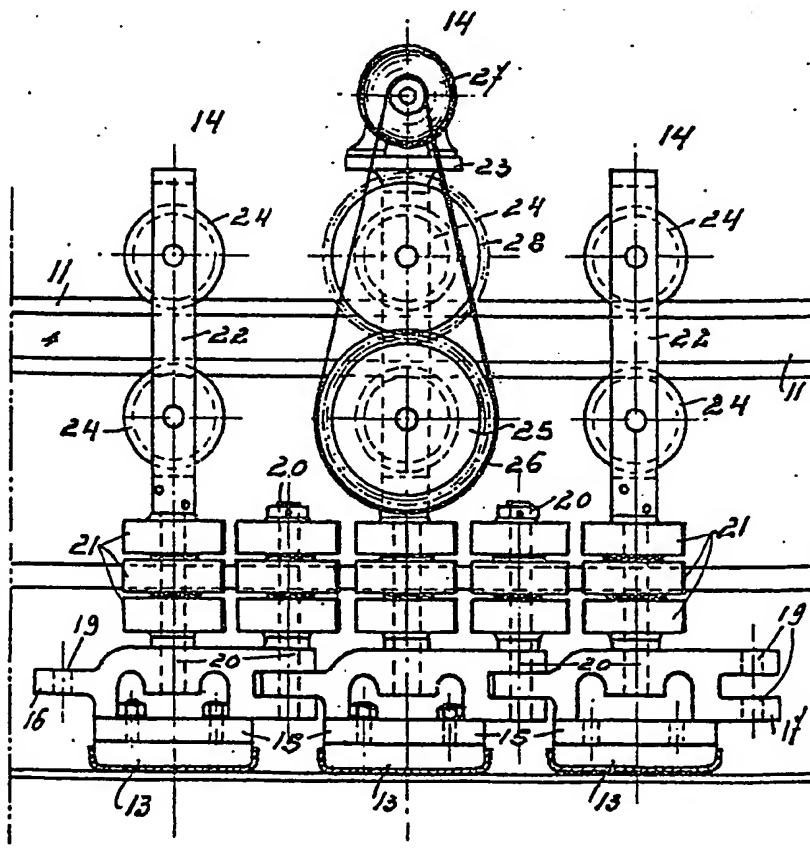
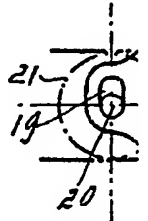
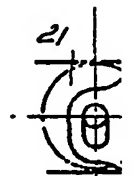
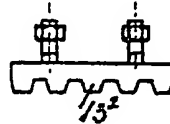


Fig. 4a.



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Fig. 5.

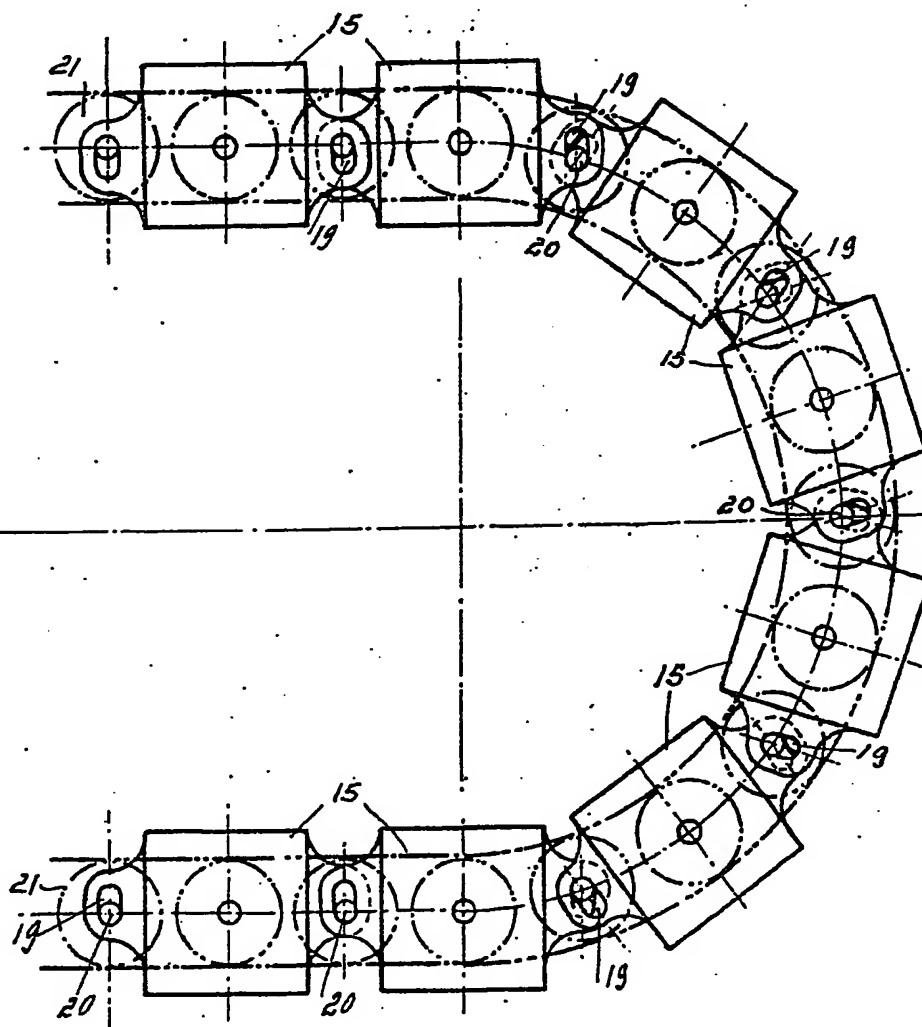


Fig. 4.

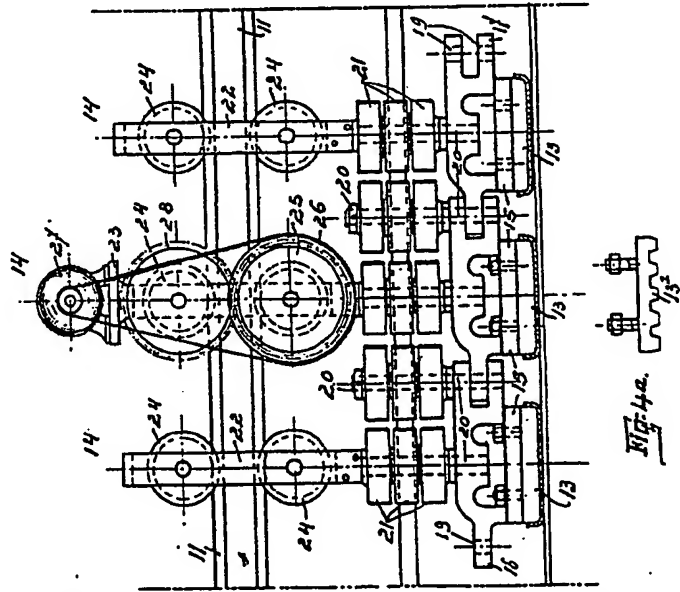
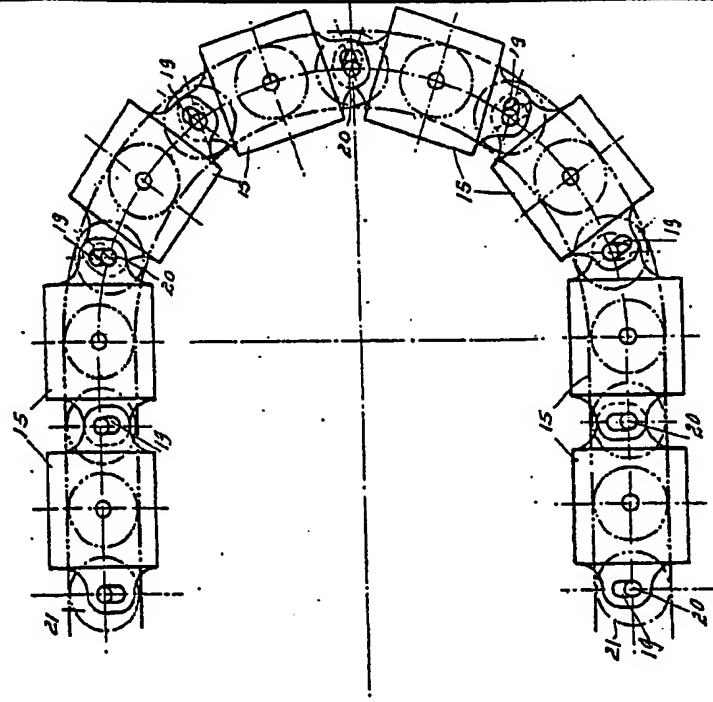
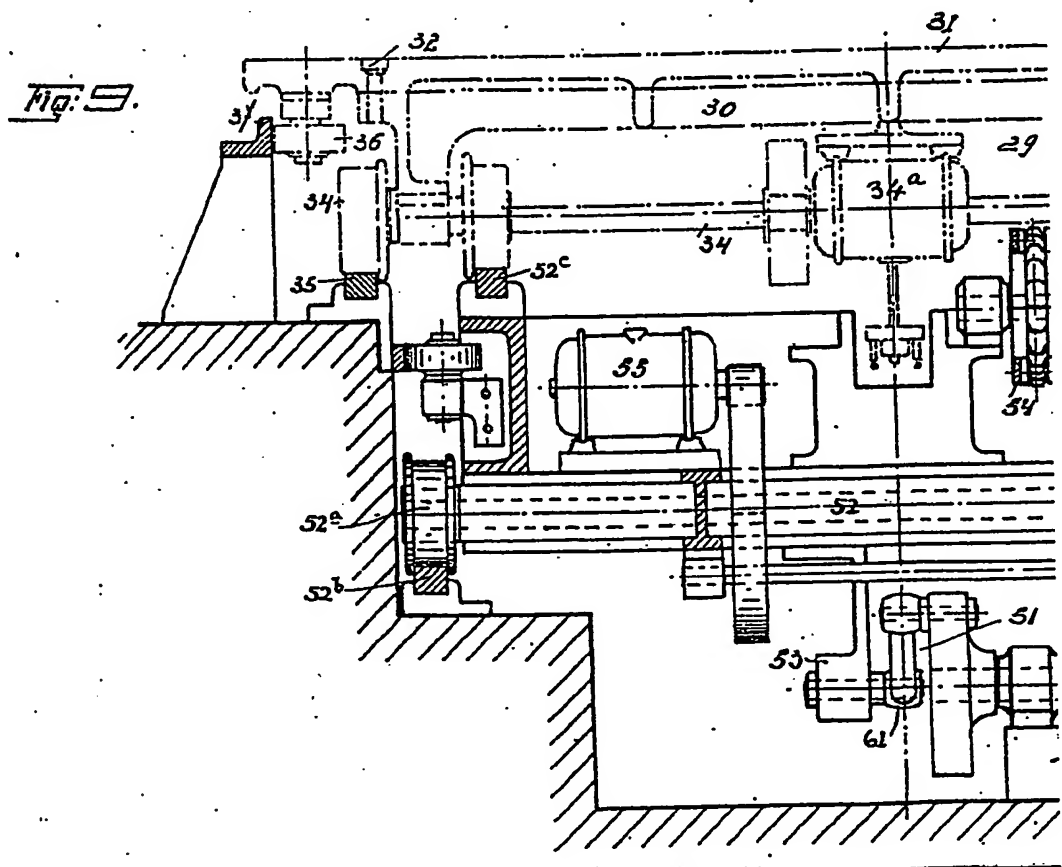
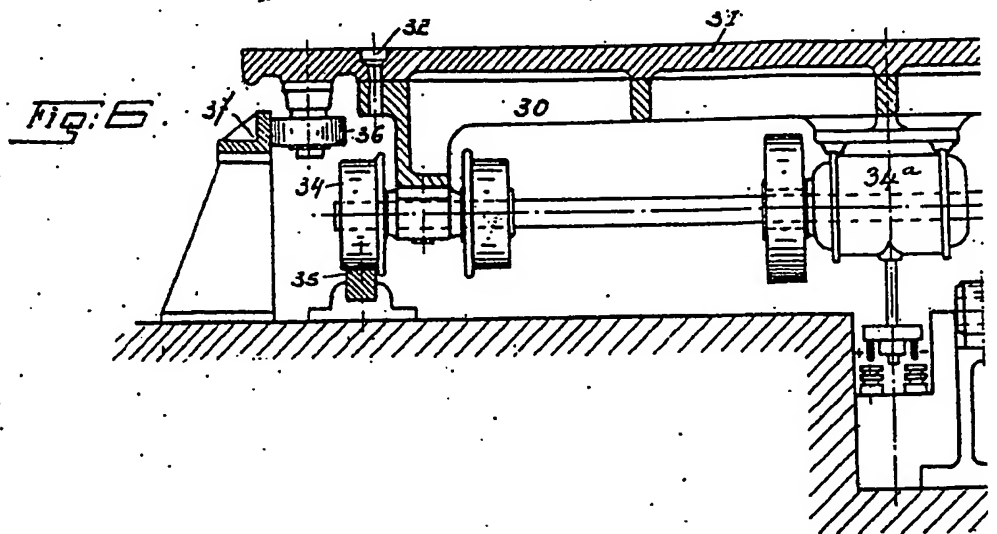


Fig. 4a.

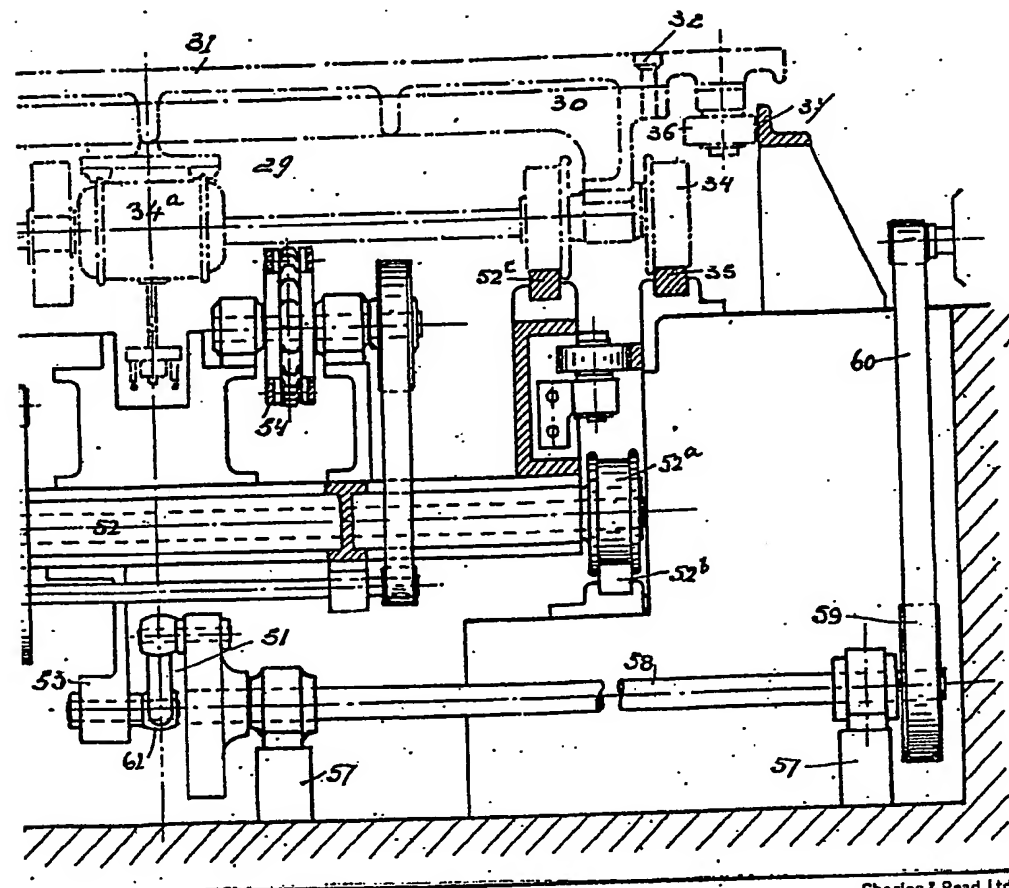
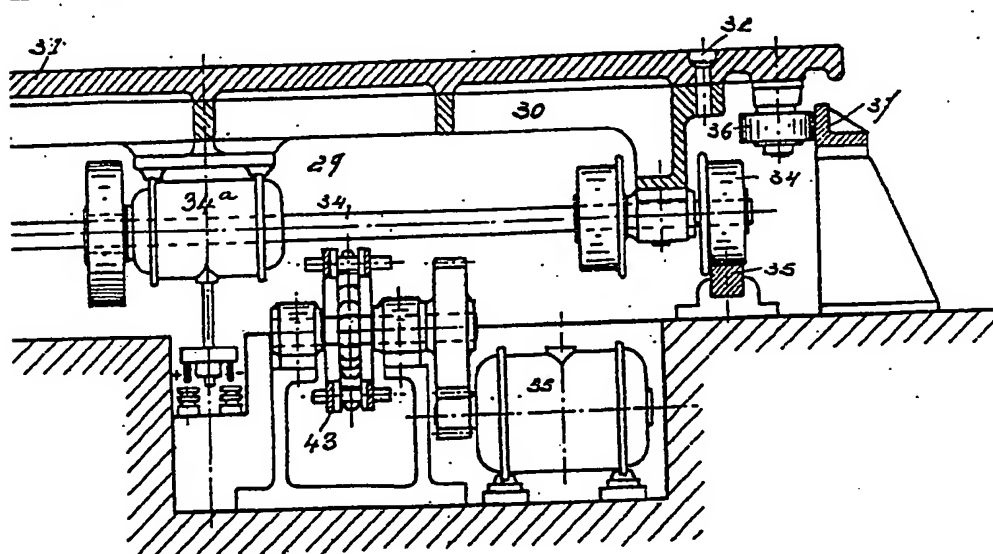
Fig. 5.



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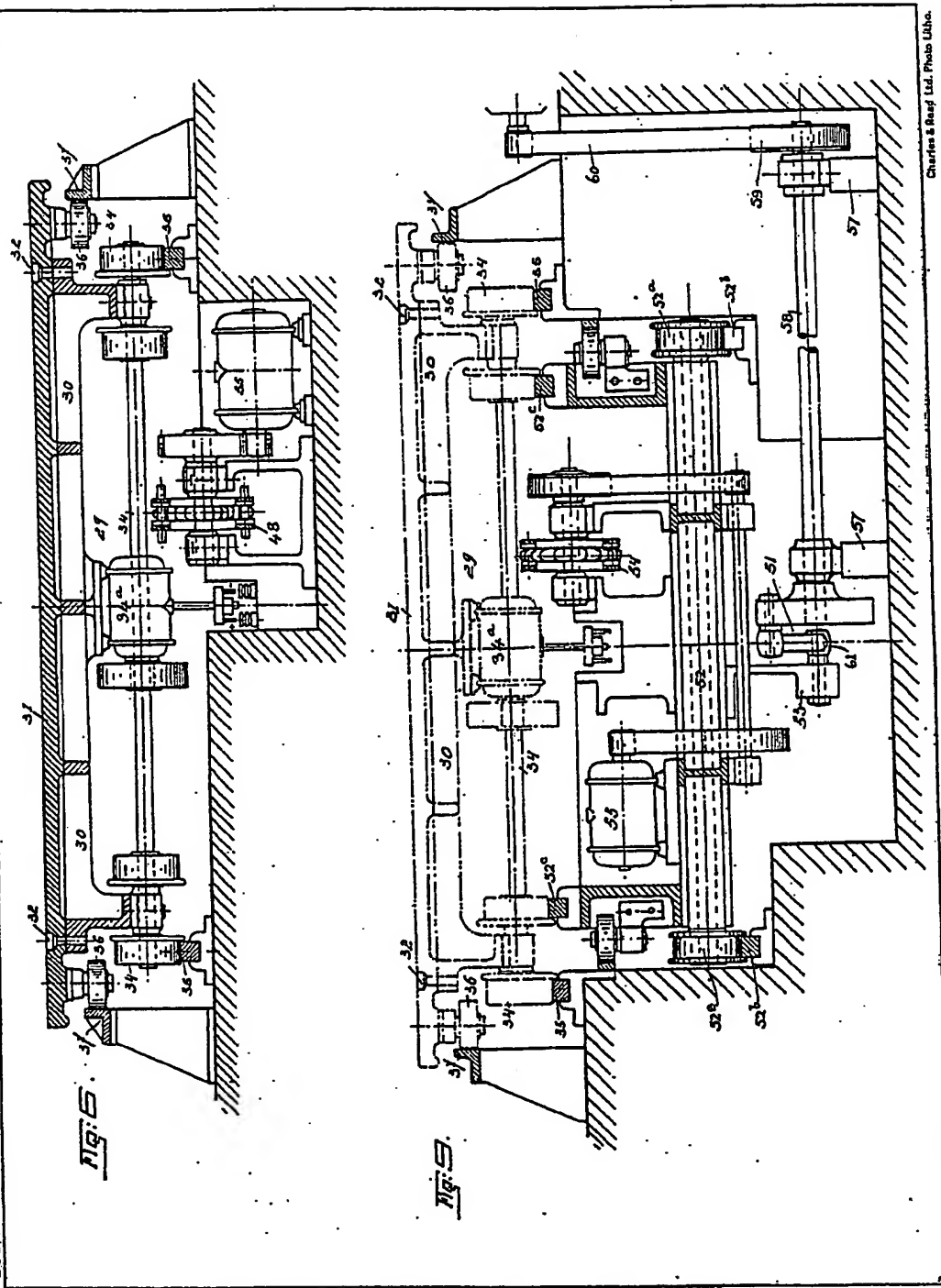


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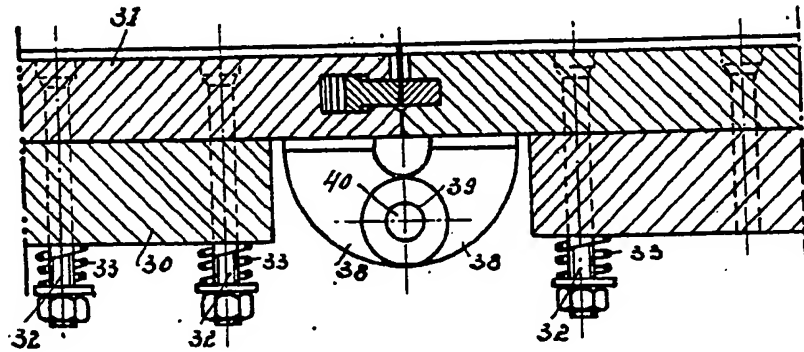


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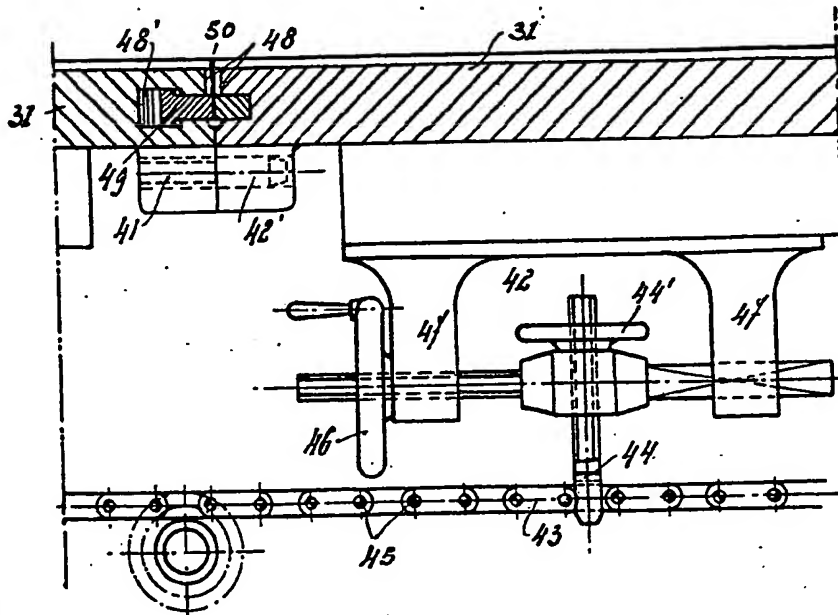


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*Fig. 7.*



*Fig. 8.*



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